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(54) Title: SKIN CARE COMPOSITION

(57) Abstract

There are provided compositions which include a retinoid and preferably retinol; a dermatologically active acid; and a volatile base, such as ammonium hydroxide. Another embodiment of the invention includes compositions comprising a retinoid and preferably retinol; a dermatologically active acid; a volatile base; and a second neutralizing agent. There are also provided compositions which include a retinoid, a neutralized ammonium salt of a dermatologically active acid, and optionally a neutralized salt, other than ammonium salt, of an acid. Further provided are methods for reducing fine lines, wrinkles, skin roughness, and pore size and for increasing the clarity of a skin surface, cellular turnover, skin radiance, skin smoothness, skin permeation or collagen synthesis in a mammal in need thereof. Compositions as described above are administered topically to the skin of the animal.

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SKIN CARE COMPOSITION

This application is a continuation-in-part of U.S. Serial No. 09/325,452, filed June 3, 1999, which claims priority from U.S. Serial No. 60/107,956, filed November 12, 1998.

FIELD OF THE INVENTION

This invention relates to skin care compositions which include, in a single formulation, the beneficial ingredients for aging or photodamaged skin, retinol and an acid.

BACKGROUND OF THE INVENTION

Retinol or vitamin A alcohol is useful in the reduction of fine lines, wrinkles, and mottled hyperpigmentation in skin. Hydroxy acids, and particularly alpha-hydroxy acids, are useful in increasing the clarity of the skin surface, increasing cellular turnover, and increasing skin radiance and smoothness. Ascorbic acid has skin permeation and collagen synthesis activity.

However, retinol is physically unstable and rapidly degrades when stored at a pH below about 5. Acids such as hydroxy acids, and particularly alpha-hydroxy acids and ascorbic acid, on the other hand, are not active in increasing skin cell turnover, exfoliation, skin permeation, and/or collagen synthesis at pHs above about 5, however.

Consequently, retinol and hydroxy acids and/or ascorbic acid have generally been packaged separately. Retinol typically is packaged in a vehicle at a pH above about 5, while alpha-hydroxy acids and ascorbic acid are packaged at a pH of about 4 or below. Therefore, one must apply two separate products in order to achieve the benefit of both of these ingredients.

The present inventors have discovered a single composition which include both of these ingredients, in which both of these ingredients are stable, and in which both of these ingredients are active upon application to the skin.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a graphic illustration of skin pH over time after treatment.

Figure 2 is a graphic illustration of cell proliferation measured as slope of fluorescence after treatment.

Figure 3 is a graphic illustration comparing the activity of ammonium hydroxide and sodium hydroxide neutralized alpha-hydroxy acids in combination with retinol.

Figure 4 is a graphic illustration of skin pH over time before and after treatment.

SUMMARY OF THE INVENTION

According to one embodiment of the present invention there are provided compositions which include:

(A) a retinoid and preferably retinol;

(B) a dermatologically active acid; and

(C) a volatile base, such as, for example, ammonium hydroxide. Volatile bases have a vapor pressure typically below atmospheric pressure, preferably below about 700 mm Hg, and more preferably below about 600 mm Hg. The volatile base preferably evaporates upon contact with skin. The compositions preferably contain an acid neutralizing effective amount of ammonium hydroxide.

Another embodiment of the present invention provides compositions which include:

(A) a retinoid and preferably retinol;

(B) a dermatologically active acid;

(C) a volatile base; and

(D) at least one second neutralizing agent.

According to yet another embodiment of the present invention, there are provided compositions which include:

(A) retinol; and

(B) a neutralized ammonium salt of a dermatologically active acid. Optionally, a second neutralized salt, other than an ammonium salt, of a dermatologically active acid is included in the compositions.

Further provided are methods for reducing fine lines, wrinkles, skin roughness, and pore size and for increasing the clarity of a skin surface, cellular turnover, skin radiance and skin smoothness in an animal, for example, a mammal, such as a human, in need thereof.

Compositions as described above are administered topically to the skin of the animal.

Methods for preparing the compositions above are also provided.

Other features and advantages of the invention will be apparent from the detailed description of the invention, the drawings, and the claims.

DETAILED DESCRIPTION OF THE INVENTION

The present formulations provide compositions which have a storage pH of about 5 or higher. This provides storage stability for the retinol compound. However, the pH of these compositions drops to below 5 when applied to the skin. This allows the hydroxy acid(s) and/or other skin beneficial acids(s) therein to become active upon application of the composition to the skin.

Retinoids suitable for use in the present invention preferably are unstable or pH sensitive in that they are chemically and physically unstable at relatively low pH such as, for example a pH below about 5, such as retinol and derivatives thereof. Suitable retinoids include, but are not limited to retinol and derivatives thereof, such as retinyl palmitate and retinyl acetate; retinaldehyde; and like compounds that bind to retinoid receptors.

Retinol is also known as vitamin A alcohol. Retinol is chemically and physically unstable at a pH below about 5. It is useful in reducing fine lines at wrinkles in skin. It is also useful in reducing mottled hyperpigmentation of skin. Other retinoids having pH dependent stability may also be used in combination with or in place of retinol in the present invention.

The dermatologically active acid may be a cosmetically active acid or a pharmaceutically active acid, such as, for example, a hydroxy acid, ascorbic acid or a derivative thereof, lipoic acid, dihydrolipoic acid, or a combination thereof.

Hydroxy acids useful in the present invention are either alpha- or beta-hydroxy acids, poly-hydroxy acids, or any combinations of any of the foregoing. Preferably, the hydroxy acid is an alpha-hydroxy acid. Examples of alpha hydroxy acids include, but are not limited to, glycolic acid, malic acid, tartaric acid, pyuric acid, citric acid, or any combination of any of the foregoing. Special mention is made of glycolic acid.

Beta-hydroxy acids include, but are not limited to, salicylic acid.

Other suitable hydroxy acids are disclosed in U.S. Patent No. 5, 889,054, which is hereby incorporated by reference.

Other acids suitable for use in the present invention include, but are not limited to, ascorbic acid and derivatives thereof, lipoic acid, and dihydrolipoic acid. Suitable ascorbic acid

derivatives include, but are not limited to, magnesium ascorbyl phosphate; sodium ascorbyl phosphate; sodium ascorbate; and ascorbyl glucosides.

Suitable second neutralizing agents which may be included in the composition include, but are not limited to, alkali hydroxides, such as sodium hydroxide and potassium hydroxide; and organic bases, such as alkanolamines, including, but not limited to, diethanolamine, triethanolamine, 2-dimethylaminoethanol (dimethyl MEA), and aminobutanol; and amino acids, including, but not limited to, arginine and lysine; and any combination of any of the foregoing. A preferred second neutralizing agent is sodium hydroxide.

Ammonium hydroxide is typically added as a solution containing from about 27 to about 31 percent by weight of ammonium hydroxide based upon 100 percent by weight of total ammonium hydroxide solution.

The compositions of the present invention may also include other adjuvants, such as, for example, vehicles including, but not limited to, water or alcohol; humectants, including, but not limited to, glycerin; buffering agents including, but not limited to, citric acid and sodium citrate; viscosity adjusters, including, but not limited to, carbomer gelling agents, gum derivatives, and other viscosity controlling, decreasing, and increasing agents; preservatives including, but not limited to, parabens, such as methylparaben and propylparaben, and phenoxyethanol; emulsifiers including, but not limited to, polysorbate 80, glyceryl distearate, POE 10 stearyl ether, steareth 10, ceateareth 20 and stearyl alcohol, and ceteareth 20 and cetearyl alcohol; conditioning agents including, but not limited to, octyl hydroxystearate, stearyl alcohol, lactose, and dimethicone; emollients including, but not limited to, cholesterol NF, petrolatum, mineral oils and esters including, but not limited to, isopropyl myristate, isopropyl palmitate, 1-decene polymer (hydrogenated), and C_{12}-C_{15} alcohol benzoates; thickeners, including, but not limited to, binders, polyacrylamide, C_{13}-C_{14} isoparafin, and laureth-7; antioxidants, including, but not limited to ascorbic acid, butylated hydroxytoluene (BHT), tocopheryl acetate, and the like; UV stabilizers; UV radiation absorbers (sunscreen filters); fragrances; colorants; chelating agents, including, but not limited to, disodium ethylenediaminetetraacetate (EDTA); or any combinations of any of the foregoing. Examples of these adjuvants are disclosed in the International Cosmetic Ingredient Dictionary and Handbook, 7th Ed. (1997)

These compositions can be formulated as creams, gels, or liquids, and preferably are prepared as lotions. These compositions can be prepared as liposomes, including, but not limited to, unilamellar, multilamellar, or paucilamellar vesicles; nanospheres; microsponges; emulsions, such as a multiple emulsion and a cleansing emulsion; or any combination of any of

the foregoing by methods known to those skilled in the art. In one embodiment, the composition is prepared as a paucilamellar vesicle having, for example, between 2 and 10 lipid bilayers and a lipophilic core which may contain an apolar oil or wax.

The compositions are typically neutralized to a pH above about 4.5, preferably ranging from about 4.5 to about 8 and most preferably from about 5 to about 6. The amount of ammonium hydroxide and optionally second neutralizing agent useful herein is that amount sufficient to adjust the pH of the compositions to the above pH ranges. The amount of ammonium hydroxide in the compositions of the present invention is preferably that amount sufficient to adjust the pH of the acid from about 4.0 or less to at least about 5.

A preferred method of preparation includes neutralizing the composition to a pH of about 4.0 or less with the aforementioned second neutralizing agent and then neutralizing the composition to a pH of at least about 5 with ammonium hydroxide.

The amount of retinoid in these compositions is typically a fine line-, wrinkle-, or mottled pigmentation-reducing effective amount. Preferably, the amount of retinol is at least about 0.01 percent by weight, and most preferably, is at least about 0.15 percent by weight, based upon 100 percent by weight of total composition.

The amount of acid, ammonium salt of acid, or other salt of the acid is typically a skin surface clarity, cellular turnover-, skin radiance-, skin smoothness-, skin permeation-, or collagen synthesis- increasing effective amount. Preferably, this amount ranges from about 0.1 to about 20 percent by weight based upon 100 percent by weight of total composition. More preferably this amount ranges from about 1 to about 12 percent by weight, and most preferably, this amount is from about 4 to about 8 percent by weight, based upon 100 percent by weight of total composition.

The composition preferably contains from about 1 to about 99 percent, and more preferably from about 60 to about 95 percent by weight of water, based upon 100 percent by weight of total composition.

Generally, the composition contains sufficient thickener to impart body to the composition without causing it to become so viscous as to hinder spreadability of the composition. The composition also preferably contains up to about 5 percent by weight of a viscosity adjuster, up to about 20 percent by weight of an emollient, from about 0.1 to about 10 percent by weight of an emulsifier, up to about 5 percent by weight of a spreading agent, up to about 10 percent by weight of a thickener, a preservative, a chelating agent, and a humectant, based upon 100 percent weight of total composition. More preferably, the composition contains

from about 0.1 to about 2 percent by weight of a viscosity adjuster, from about 3 to about 5 percent by weight of an emulsifier, from about 1 to about 2 percent by weight of a spreading agent, an antimicrobially effective amount of a preservative, and from about 3 to about 5 percent by weight of a thickener, based upon 100 percent weight of total composition.

Without being bound by any theory, applicants believe that by using the ammonium salt of the acid, the storage pH of the present composition can remain above 5, thereby providing a stable atmosphere for the retinol or any other pH sensitive ingredient. However, when applied to the skin, the pH of the ammonium salt of the acid changes by volatilization of the ammonium. The pH drops to a range in which the acid can cause beneficial changes.

The compositions can be applied topically to a mammal, and preferably a human, in need of a retinoid, acids, or a combination thereof. Typically, the amount applied will be that amount effective to accomplish the purpose of application.

The following examples illustrate the invention without limitation. All amounts are given as weight percentages based upon 100 percent by weight of total composition unless noted otherwise.

Example 1

A retinol/alpha-hydroxy acid composition having the formulation of Table 1 and a pH of about 6 and containing paucilamellar vesicles was prepared by a shear mixing method. The apparatus used to prepare the liposomes by the shear mixing method is described in U.S. Patent No. 4,895,452, which is hereby incorporated by reference. A mixture containing the appropriate amounts of the ingredients for the lipid phase was heated in a container at about 75° C until all of the lipids melted. The lipid melt was then cooled to about 65° C. The ingredients for the aqueous phase were mixed together, heated to about 75° C to dissolve them, and then cooled to about 60° C. The lipid melt and aqueous phase mixture were then poured into separate holding reservoirs of the shear mixing apparatus. The positive displacement pump for the lipid melt and aqueous phase mixture feed lines were turned on. The feed rate was adjusted to 1 part lipid to 4 parts aqueous phase. The aqueous phase mixture and lipid melt were fed through injection jets into a cylindrical mixing chamber tangentially with respect to the cylinder wall. In the mixing chamber, the two streams of flowing liquid intersect in such a manner as to

cause shear mixing that leads to the formation of liposomes. The liposomes formed were then withdrawn through an exit tube and transferred to a Cafero mixing vesicle. The liposomes were cooled to 40° C, under mixing at 200 rpm. After cooling, the single addition components listed in Table 1, were added sequentially. The resultant mixture was then mixed at 200 rpm for about 30 minutes. The formulation was allowed to cool to room temperature under ambient conditions.

Table 1

Retinol/Alpha-Hydroxy Acid Liposome Formulation-pH6

TRADE NAME	CHEMICAL NAME	FUNCTION	%WT/WT
AQUEOUS PHASE			
Deionized Water	D.I. Water	Vehicle	60.93
Glycerin 916	Glycerin	Humectant	4
Citric Acid	Citric Acid	Buffering Agent	0.13
Sodium Citrate	Sodium Citrate	Buffering Agent	0.5
Sodium Chloride	Sodium Chloride	Viscosity Adjuster	0.1
Methyl Parasept	Methylparaben	Preservative	0.25
Propyl Parasept	Propylparaben	Preservative	0.15
Tween 80	Polysorbate 80	Emulsifier	0.7
Glypure (70%)	Glycolic Acid	Skin Conditioner	5.71
NH4OH^	Ammonium Hydroxide (27 to 31% Solution)	pH Adjuster (pH=6)	3.2
LIPID PHASE			
Wickenol 171	Octyl Hydroxystearate	Conditioning Agent	5.8
Kessco GDS	Glyceryl Distearate	Emulsifier	2.8
Cholesterol, NH	Cholesterol NF	Emulsifer	1
BRIJ 76	POE 10 Stearyl Ether	Emulsifer	1.4
Protocol ST 20G	Ceteareth 20 and Stearyl Alcohol	Emulsifier	3

Protocol CS 20D	Ceteareth 20 and Stearyl Alcohol	Emulsifier	3
Stearyl Alcohol	Stearyl Alcohol	Skin Conditioner	0.5
Retinol 50C™**	Retinol in Polysorbate-20	Skin Conditioner	0.4
BHT	BHT	Antioxidant	0.1
Vitamin E Acetate	Tocopheryl Acetate	Antioxidant	0.1
SINGLE ADDITION COMPONENTS			
Emeressence 1160	Phenoxyethanol	Preservative	0.73
Dimethicone 47V	100 Centistoke Dimethicone	Skin Conditioner	2.5
Sepigel 305	Polyacrylamide, C13-24 Isoparrifin and Laureth-7	Thickener	3

**Retinol 50C™ is available from BASF of Mount Olive, NJ, and contains 50% by weight of retinol.

^Amount of NH_4OH required to reach pH of 6 is estimated; each batch will be titrated to pH=6.

The formulation was applied to the skin, and the pH of the skin was measured over time. Results are illustrated in Figure 1. The pH of the preparation dropped to about 4.1 within 15 minutes of application. This reduced the skin pH to about 4.

Comparative Example 1A

A retinol/alpha-hydroxy acid containing composition having the formulation of Table 2 and a pH of about 4 was prepared as described in Example 1. The amount of ammonium hydroxide in this composition was approximately half the amount incorporated in the composition of Example 1.

Table 2

Retinol/Alpha-Hydroxy Acid Liposome Formulation - pH4

TRADE NAME	CHEMICAL NAME	FUNCTION	%WT/WT
AQUEOUS PHASE	**(qs with DI water)**		
Deionized Water	D.I. Water	Vehicle	62.43
Glycerin 916	Glycerin	Humectant	4
Citric Acid	Citric Acid	Buffering Agent	0.13
Sodium Citrate	Sodium Citrate	Buffering Agent	0.5
Sodium Chloride	Sodium Chloride	Viscosity Adjuster	0.1
Methyl Parasept	Methylparaben	Preservative	0.25
Propyl Parasept	Propylparaben	Preservative	0.15
Tween 80	Polysorbate 80	Emulsifier	0.7
Glypure (70%)	Glycolic Acid	Skin Conditioner	5.71
NH_4OH^	Ammonium Hydroxide 27 to 31% Solution	pH Adjuster (pH=4)	1.7
LIPID PHASE			
Wickenol 171	Octyl Hydroxystearate	Conditioning Agent	5.8
Kessco GDS	Glyceryl Distearate	Emulsifier	2.8
Cholesterol, NH	Cholesterol NF	Emollient	1
BRIJ 76	POE 10 Stearyl Ether	Emulsifer	1.4
Protocol ST 20G	Ceteareth 20 and Stearyl Alcohol	Emulsifier	3
Protocol CS 20D	Ceteareth 20 and Stearyl Alcohol	Emulsifier	3
Stearyl Alcohol	Stearyl Alcohol	Skin Conditioner	0.5
Retinol 50C™**	Retinol in Polysorbate-20	Skin Conditioner	0.4
BHT	BHT	Antioxidant	0.1

Vitamin E Acetate	Tocopheryl Acetate	Antioxidant	0.1
SINGLE ADDITION COMPONENTS			
Emeressence 1160	Phenoxyethanol	Preservative	0.73
Dimethicone 47V	100 Centistoke Dimethicone	Skin Conditioner	2.5
Sepigel 305	Polyacrylamide, C_{13-24} Isoparrifin and Laureth-7	Thickener	3

**Retinol 50C™ is available from BASF of Mount Olive, NJ, and contains 50% by weight of retinol.

^Amount of NH_4OH required to reach pH of 4 is estimated.

The formulation was applied to skin, and the pH of the skin was measured over time. Results are illustrated in Figure 1.

Comparative Example 1B

A retinol/alpha-hydroxy acid containing composition was prepared as described in Example 1 above, except sodium hydroxide was substituted for the ammonium hydroxide.

The formulation was applied to skin, and the pH of the skin was measured over time. Results are illustrated in Figure 1.

Comparative Example 1C

An alpha-hydroxy acid containing composition having 8 percent by weight sodium glycolate at a pH of about 3.5 and no retinol was prepared as described in Example 1 above.

The formulation was applied to skin, and the pH of the skin was measured over time. Results are illustrated in Figure 1.

Example 2

A composition containing 0.15 percent by weight of retinol and 4 percent by weight of glycolic acid, neutralized with ammonium hydroxide to a pH of about 6 was prepared as described in Example 1 above.

An *in vivo* study of proliferative activity on skin was conducted. The marker of proliferative activity is an increase in fluorescent signal in the ultraviolet portion of the light

spectrum. Over the course of 11 days of application, the fluorescence of the epidermis (exciting with 296 nm radiation, monitoring fluorescence at 340 nm) increases with increased proliferation activity. This fluorescence marker also increases after another proliferation inducing treatment such as tape-stripping, and has been shown to correlate with increased cell turnover-rate as measured by increased loss of epidermal stain, dansyl chloride.

The slope of the increased fluorescence is illustrated in Figure 2.

Comparative Example 2A

An *in vivo* study as described in Example 2 was conducted using a preparation containing no glycolic acid or retinol at pH 6 (placebo).

The slope of the increased fluorescence is illustrated in Figure 2.

Comparative Example 2B

An *in vivo* study as described in Example 2 was conducted using a preparation containing 4 percent by weight of partially neutralized glycolic acid at pH 4 without retinol (Avon ANEW®).

The slope of the increased fluorescence is illustrated in Figure 2.

Comparative Example 2C

An *in vivo* study as described in Example 2 was conducted using a preparation containing 8 percent by weight of glycolic acid partially neutralized at pH 3.8 without retinol (Neutrogena HEALTHY SKIN®).

The slope of the increased fluorescence is illustrated in Figure 2.

Comparative Example 2D

An *in vivo* study as described in Example 2 was conducted on untreated skin.

The slope of the increased fluorescence is illustrated in Figure 2.

Figure 2 illustrates a significant increase in fluorescence activity and, therefore, cell proliferation in the retinol/glycolic acid preparation of Example 2 in comparison with both a placebo (Example 2A) and untreated skin (Example 2D).

Figure 2 also illustrates a significant increase in fluorescence activity and, therefore, cell proliferation in the retinol/glycolic acid preparation of Example 2 which is similar

to that of glycolic acid containing products having pH's of about 4 (Comparative Examples 2B-D).

Example 3

A composition containing 0.15 percent by weight of retinol and 4 percent by weight of glycolic acid neutralized to pH 5.5 with ammonium hydroxide as in Example 1 was prepared.

Fluorescence was measured as in Example 2. Results are illustrated in Figure 3.

Comparative Example 3A

A composition containing 0.15 percent by weight of retinol and 4 percent by weight of glycolic acid neutralized to pH 5.5 with sodium hydroxide as in Example 1 was prepared.

Fluorescence was measured as in Example 2. Results are illustrated in Figure 3.

Comparative Example 3B

The fluorescence of untreated skin was measured as in Example 2. Results are illustrated in Figure 3.

Figure 3 illustrates that while ammonium glycolate (Example 3) dissociates when applied to the skin, sodium glycolate apparently does not (Comparative Example 3A). The latter results in little change in proliferative activity of the skin, and thus no apparent skin benefit.

Example 4

A composition prepared as in Example 1 was stored for 13 weeks at 40° C (simulating 2 years of ambient aging). This preparation retained 87% of the original retinol content after storage.

Comparative Example 4A

A composition prepared in Comparative Example 1A was stored for 13 weeks at 40° C (simulating 2 years of ambient aging). This preparation retained only 52% of the original retinol content after storage.

Example 5

A retinol/alpha-hydroxy acid containing composition having the formulation of Table 3 and containing paucilamellar vesicles was prepared as in Example 1 above. After the single addition components were added, a slurry of water and Cabopol ETD 2020 was added to the composition. Mirasil DM 100 and Phenoxetol were added thereto sequentially under mixing at 200 rpm for about 30 minutes. The formulation was allowed to cool to about 25° C under ambient conditions. The composition did not contain ammonium hydroxide.

Table 3

TRADE NAME	CHEMICAL NAME	FUNCTION	% WT/WT
LIPID PHASE			
Brij 76	Steareth-10		1.4
Kessco GDS	Glyceryl Distearate	Emulsifier	2.8
Cholesterol NF	Cholesterol	Emulsifier	1
Procol ST 20G	Ceteareth-20 & Stearyl Alcohol	Emulsifier	3
Procol CS 20D	Ceareareth-20 & Cetearyl Alcohol	Emulsifier	3
Lanol S	Stearyl Alcohol	Skin Conditioner	0.5
Wickenol 171	Octyl Hydroxystearate	Conditioning Agent	5.8014
BHT	BHT	Antioxidant	0.1
Tween 80	Polysorbate 80	Emulsifier	0.7
Retinol 50C™**	Retinol in Polysorbate-20	Skin Conditioner	0.25
AQUEOUS PHASE			
Eau purifiee	Aqua	Vehicle	41.0843
Pricerin 9099	Glycerin	Humectant	4
Methylparaben	Methylparaben	Preservative	0.25
Propylparaben	Propylparaben	Preservative	0.15
Disodium EDTA	Disodium EDTA		0.1
Lactose Rectapur	Lactose		5
Glypure 70%	Glycolic acid (70%)	Skin Conditioner	5.7143

Sodium Hydroxide	Sodium Hydroxide	pH Adjuster	1.32
Eau purifiee	Aqua	Vehicle	20
Carbopol ETD 2020	Acrylates/ C10-30 Alkyl Acrylate crosspolymer	Thickener	0.6
SINGLE ADDITION COMPONENTS			
Mirasil DM 100	Dimethicone	Skin Conditioner	2.5
Phenoxetol	Phenoxyethanol	Preservative	0.73

**Retinol 50C™ is available from BASF of Mount Olive, NJ, and contains 50% by weight of retinol.

A control having the formulation of Table 3 was prepared excluding ammonium hydroxide and sodium hydroxide (Example 5A). The composition and control were applied to skin, and the pH of the skin was measured over time. Results are illustrated in Figure 4.

Example 6

A retinol/alpha-hydroxy acid containing composition having the formulation of Table 4 and a pH of about 5.8 was prepared as described in Example 5, except 3% by weight of ammonium hydroxide was substituted for the sodium hydroxide in Example 5.

Table 4

TRADE NAME	CHEMICAL NAME	FUNCTION	% WT/WT
Brij 76	Steareth-10		1.4
LIPID PHASE			
Kessco GDS	Glyceryl Distearate	Emulsifier	2.8
Cholesterol NF	Cholesterol	Emulsifier	1
Procol ST 20G	Ceteareth-20 & Stearyl Alcohol	Emulsifier	3
Procol CS 20D	Cereareth-20 & Cetearyl Alcohol	Emulsifier	3
Lanol S	Stearyl Alcohol	Emulsifier	0.5
Wickenol 171	Octyl Hydroxystearate	Emulsifier	5.8014

BHT	BHT	Antioxidant	0.1
Tween 80	Polysorbate 80	Emulsifier	0.7
Retinol 50C™**	Retinol in Polysorbate-20	Skin Conditioner	0.25
Eau purifiee	Aqua	Vehicle	39.4043
AQUEOUS PHASE			
Pricerin 9099	Glycerin	Humectant	4
Methylparaben	Methylparaben	Preservative	0.25
Propylparaben	Propylparaben	Preservative	0.15
Disodium EDTA	Disodium EDTA		0.1
Lactose Rectapur	Lactose		5
Glypure 70%	Glycolic acid (70%)	Skin Conditioner	5.7143
Ammonium Hydroxide	Ammonium Hydroxide (30%)	pH Adjuster	3
Eau purifiee	Aqua	Vehicle	20
Carbopol ETD 2020	Acrylates/ C10-30 Alkyl Acrylate crosspolymer	Thickener	0.6
SINGLE ADDITION COMPONENTS			
Mirasil DM 100	Dimethicone	Skin Conditioner	2.5
Phenoxetol	Phenoxyethanol	Preservative	0.73

**Retinol 50C™ is available from BASF of Mount Olive, NJ, and contains 50% by weight of retinol.

A control having the formulation of Table 4 was prepared excluding ammonium hydroxide (Example 6A). The composition and control were applied to skin, and the pH of the skin was measured over time. Results are illustrated in Figure 4.

Examples 7 and 8

Two retinol/alpha-hydroxy acid containing multilamellar liposomal compositions having the formulations of Table 5 below are prepared as follows.

Table 5

TRADE NAME	CHEMICAL NAME	Function	Example 7 (%W/W)	Example 8 (% W/W)	Ranges
LIPID PHASE					
Glyceryl Dilaurate	Glyceryl Dilaurate	Nonionic Surfactant	2.8	2.8	1.4-8.4
Cholesterol	Cholesterol	Nonionic Surfactant	0.9	0.9	0.45-2.7
POE 10 Stearyl Alcohol	POE 10 Stearyl Alcohol	Nonionic Surfactant	2.5	2.5	1.25-7.5
Laureth-9	Laureth-9	Nonionic Surfactant	1.24	1.24	0.62-3.72
Butylated Hydroxytoluene (BHT)	BHT	Anti-oxidant	0.05	0.05	0-3
Retinol 50C™	Retinol in Polysorbate-20	Skin Conditioner	0.2	0.4	0.01-2
AQUEOUS PHASE					
Citric Acid	Citric Acid	Anti-oxidant	0.4	0.4	0.1-0.8
Trisodium Citrate dihydrate	Trisodium Citrate dihydrate	Buffer	0.6	0.6	0.1-0.8
Ascorbic Acid	Ascorbic Acid	Anti-oxidant	0.01	0.01	0.01-0.1
Glycerin	Glycerin	Humectant	0	4.0	0-20
Disodium EDTA	Disodium EDTA	Chelating Agent Preservative	0.2	0.2	0.01-0.2
Phenoxyethanol	Phenoxyethanol	Preservative	0.5	0.5	0.01-0.5
Methylparaben	Methylparaben	Preservative	0.25	0.25	0.01-0.2
Propylparaben	Propylparaben	Preservative	0.15	0.15	0.01-0.2
Glypure (70%)		Skin Conditioner	5.71	5.71	0.01-15
Ammonium Hydroxide (27 to 31%)	Ammonium Hydroxide (27 to 31%)	pH adjuster (pH=6)	3.2	3.2	0.01-10
Water	Water	Carrier	81.29	77.06	40-90

These compositions may be prepared by the following two methods.

1. Shear Mixing Method: Appropriate amounts of the lipid phase ingredients are mixed in a container heated to about 75° C until all the lipids have melted. The lipid melt is then cooled to

about 65° C. The aqueous phase ingredients are mixed and heated to about 75° C to dissolve them and then cooled to about 60° C. The lipid melt and aqueous phase mixture are poured into separate holding reservoirs of a shear mixing apparatus for preparing liposomes as described in U.S. Patent No. 4,895,452. The positive displacement pump for the lipid and aqueous feed lines is turned on. The feed rate will depend on the desired viscosity of the composition. For a thinner consistency, a feed rate of 1 part lipid to 9 parts aqueous phase may be utilized. For thicker consistencies, a feed rate of 1 part lipid phase to 4 parts aqueous phase may be utilized. After the feed rate is adjusted, valves to the feed lines are opened and the aqueous phase mixture and lipid melt are fed through injection jets into a cylindrical mixing chamber tangentially with respect to the cylinder wall. In the mixing chamber, the two streams of liquid intersect in such a manner as to cause shear mixing that causes the formation of liposomes. The liposomes are then withdrawn through an exit tube.

2. Syringe Method: Appropriate amounts of the lipid phase ingredients are mixed in a beaker at 75° C until the lipids melt. The lipid melt is drawn into a syringe, which was preheated in a water bath to about 75° C. A second syringe containing appropriate amounts of the aqueous phase ingredients is preheated in a water bath to about 70° C. The two syringes were then connected via a 3-way metal stopcock. The ratio of aqueous phase mixture to lipid phase mixture was about 4:1 or 4 ml of aqueous phase mixture to 1 ml of lipid phase mixture. The ratio of aqueous phase mixture to lipid phase mixture can be adjusted to obtain the desired viscosity. After injecting the aqueous phase mixture into the lipid phase mixture, the resulting mixture is rapidly mixed back and forth between the two syringes several times until the contents cool to about 25-30° C.

Examples 9 and 10

Two oil-in-water emulsions of the present invention are shown in Table 6.

Table 6

TRADE NAME	CHEMICAL NAME	Function	Example 9 (%W/W)	Example 10 (%W/W)	Ranges
OIL PHASE					
Cetearyl Glucoside	Cetearyl Glucoside	Surfactant	1.4	1.4	0.1-2.8
C12-15 Alkyl Benzoate	C12-15 Alkyl Benzoate	Surfactant	4.0	4.0	1-6
Octyl Hydroxystearate	Octyl Hydroxystearate	Emollient	1.0	1.0	0-5
Dimethicone	Dimethicone	Spreading Agent	1.0	1.0	0-5
Cyclomethicone	Cyclomethicone	Spreading Agent	1.0	1.0	0-5
Cetyl Alcohol	Cetyl Alcohol	Emollient	2.5	2.5	0-4
Butylated Hydroxytoluene	BHT	Anti-oxidant	0.05	0.05	0-3
Octyl Methoxycinnamate	Octyl Methoxycinnamate	Sunscreen	6.0	6.0	0-10
Propylparaben	Propylparaben	Preservative	0.5	0.1	0-0.5
Vitamin E acetate	Vitamin E acetate	Anti-oxidant	0.5	0.5	0-0.5
Retinol	Retinol	Anti-Wrinkle	0.25	0.4	0.01-5
Tocopherol Acetate	Tocopherol Acetate	Anti-oxidant	0.5	0.5	0-0.5
AQUEOUS PHASE					
Glycerin	Glycerin	Humectant	3.0	3.0	0-20
D-Pathenol	D-Pathenol	Pro-Vitamin	0.5	0.5	0-5
Disodium EDTA	Disodium EDTA	Chelator, whitening agent	0.1	0.1	0.01-1
Methyl Paraben	Methyl Paraben	Preservative	0.2	0.2	0-0.3
Carbomer		Thickener	0.35	0.35	0-3
Glycolic acid (70%)	Glycolic acid (70%)	Skin Conditioner	5.71	5.71	0-15
Ammonium Hydroxide	Ammonium Hydroxide	pH adjuster	3.2	3.2	0-1
Deionized Water	Deionized Water	Carrier	68.19	68.04	50-80

Each emulsion is prepared by mixing the lipid phase ingredients and heating the mixture to about 85° C. The lipid phase mixture is then cooled to about 60° C.

In a separate vessel, the carbomer is slowly added to the water. After mixing for about 10 minutes the remaining aqueous phase ingredients are added and the mix is heated to about 60° C.

The two phases are then combined, mixed for about 10 minutes, and cooled to room temperature. One or more depigmentation agents may be added to the formulations in these examples.

Examples 11 and 12

Two water-in-oil emulsions of the present invention are shown in Table 7.

Table 7

TRADE NAME	CHEMICAL NAME	Function	Example 11 (%W/W)	Example 12 (%W/W)	Preferred Ranges
OIL PHASE					
Mineral Oil	Mineral Oil	Emollient	25.0	25.0	40-80
Sorbitan Monooleate	Sorbitan Monooleate	Surfactant	5.0	5.0	1-6
Stearyl Alcohol	Stearyl Alcohol	Emollient	25.0	25.0	20-60
Dimethicone	Dimethicone	Spreading Agent	1.0	1.0	1-5
Cetyl Alcohol	Cetyl Alcohol	Emollient	2.0	2.0	0.1-10
Hydrogenated Lecithin	Hydrogenated Lecithin	Anti-oxidant	3.0	3.0	0-10
Parsol MCX		Sunscreen	3.0	3.0	0-10
Butylated Hydroxytoluene	BHT	Anti-oxidant	0.05	0.05	0-3
Retinol	Retinol	Anti-Wrinkle	0.25	0.4	0.01-5
Propylparaben	Propylparaben	Preservative	0.5	0.5	0.01-0.5
Vitamin E acetate	Vitamin E acetate	Anti-oxidant	0.5	0.5	0.01-0.5
AQUEOUS PHASE					
Glycerin	Glycerin	Humectant	3.0	3.0	0-20
Methyl Paraben	Methyl Paraben	Preservative	0.2	0.2	0.01-0.3

Water	Water	Carrier	22.59	22.44	20-45
Glycolic acid (70%)	Glycolic acid (70%)	Skin Conditioner	5.71	5.71	0-15
Ammonium Hydroxide	Ammonium Hydroxide	pH adjuster	3.2	3.2	0-1

Each emulsion is prepared by melting stearyl alcohol and mineral oil at about 70° C. The other oil phase ingredients are added and the mixture is heated to about 75° C. The aqueous phase ingredients are dissolved in water and warmed to about 70° C. The aqueous phase mixture is added to the oil phase mixture. The resulting mixture is stirred until it congeals.

All patents, publications, applications, and test methods mentioned herein are hereby incorporated by reference.

Many variations of the present invention will suggest themselves to those skilled in the art in light of the above, detailed description. All such obvious variations are within the full intended scope of the appended claims.

Claims:

1. A composition comprising:

(A) a retinoid;

(B) a dermatologically active acid; and

(C) ammonium hydroxide.

2. A composition as defined in claim 1, wherein said retinoid is selected from the group consisting of retinol and derivatives thereof and retinaldehyde.

3. A composition as defined in claim 2, wherein said retinoid is retinol.

4. A composition as defined in claim 1, wherein said dermatologically active acid is selected from the group consisting of a hydroxy acid, ascorbic acid and derivatives thereof, lipoic acid, dihydrolipoic acid, or a combination thereof.

5. A composition as defined in claim 4, wherein said hydroxy acid is an alpha-hydroxy acid.

6. A composition as defined in claim 5, wherein said alpha-hydroxy acid is selected from the group consisting of malic acid, tartaric acid, lactic acid, pyruvic acid, citric acid, or any combination of any of the foregoing.

7. A composition as defined in claim 5, wherein said alpha-hydroxy acid is glycolic acid.

8. A composition as defined in claim 3, wherein said hydroxy acid is glycolic acid.

9. A composition as defined in claim 4, wherein said hydroxy acid is salicylic acid.

10. A composition as defined in claim 1, wherein said retinoid comprises from about 0.01 to about 10 percent by weight, based upon 100 percent by weight of total composition.

11. A composition as defined in claim 1, wherein the amount of said acid ranges from about 0.1 to about 20 percent by weight, based upon 100 percent by weight of total composition.

12. A composition as defined in claim 8, said composition comprises from about 0.01 to about 10 percent by weight of retinoid and from about 0.1 to about 20 percent by weight of said acid, based upon 100 percent of total composition.

13. A composition as defined in claim 1, wherein the amount of ammonium hydroxide is effective to neutralize said composition to a pH ranging from about 4.5 to about 8.

14. A composition as defined in claim 13, wherein the amount of ammonium hydroxide is sufficient to neutralize said composition to a pH ranging from about 5 to about 6.

15. A composition as defined in claim 12, wherein the amount of ammonium hydroxide is sufficient to neutralize said composition to a pH ranging from about 5 to about 6.

16. A composition as defined in claim 1, comprising a paucilamellar vesicle.

17. A composition as defined in claim 1, further comprising a second neutralizing agent.

18. A composition as defined in claim 17, wherein said second neutralizing agent comprises an alkali hydroxide, alkanolamine, amino acid, or any combination of any of the foregoing.

19. A composition as defined in claim 18, wherein said second neutralizing agent comprises sodium hydroxide, potassium hydroxide, diethanolamine, triethanolamine, 2-dimethylaminoethanol (dimethyl MEA), aminobutanol, arginine, lysine, or any combination of

any of the foregoing.

20. A composition comprising:

(A) retinoid; and

(B) a neutralized ammonium salt of a dermatologically active acid.

21. A composition as defined in claim 20, further comprising (C) at least one second neutralized salt, other than an ammonium salt, of a dermatologically active acid.

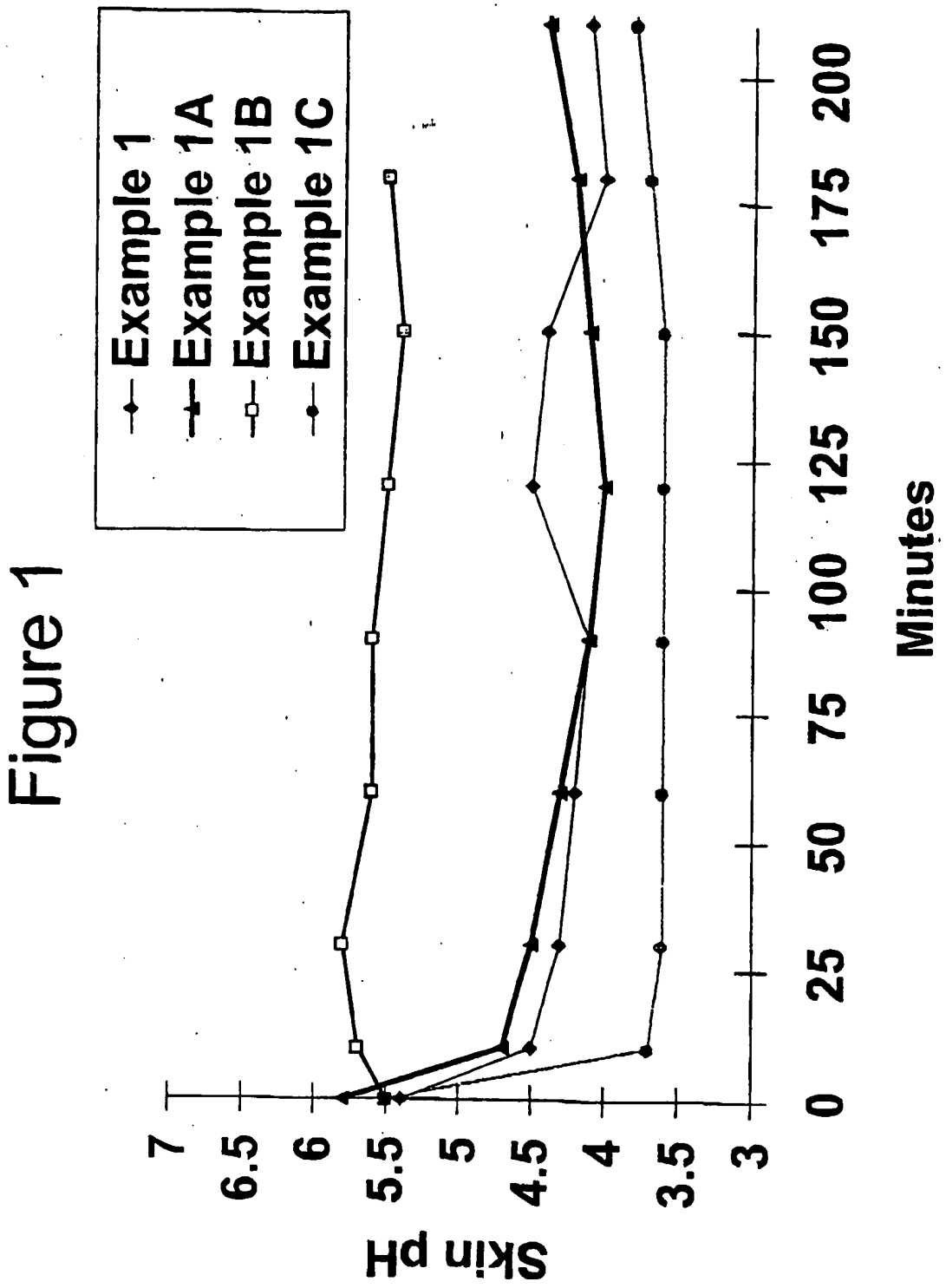
22. A composition as defined in claim 21, wherein said second neutralizing agent comprises an alkali hydroxide, alkanolamine, amino acid, or any combination of any of the foregoing.

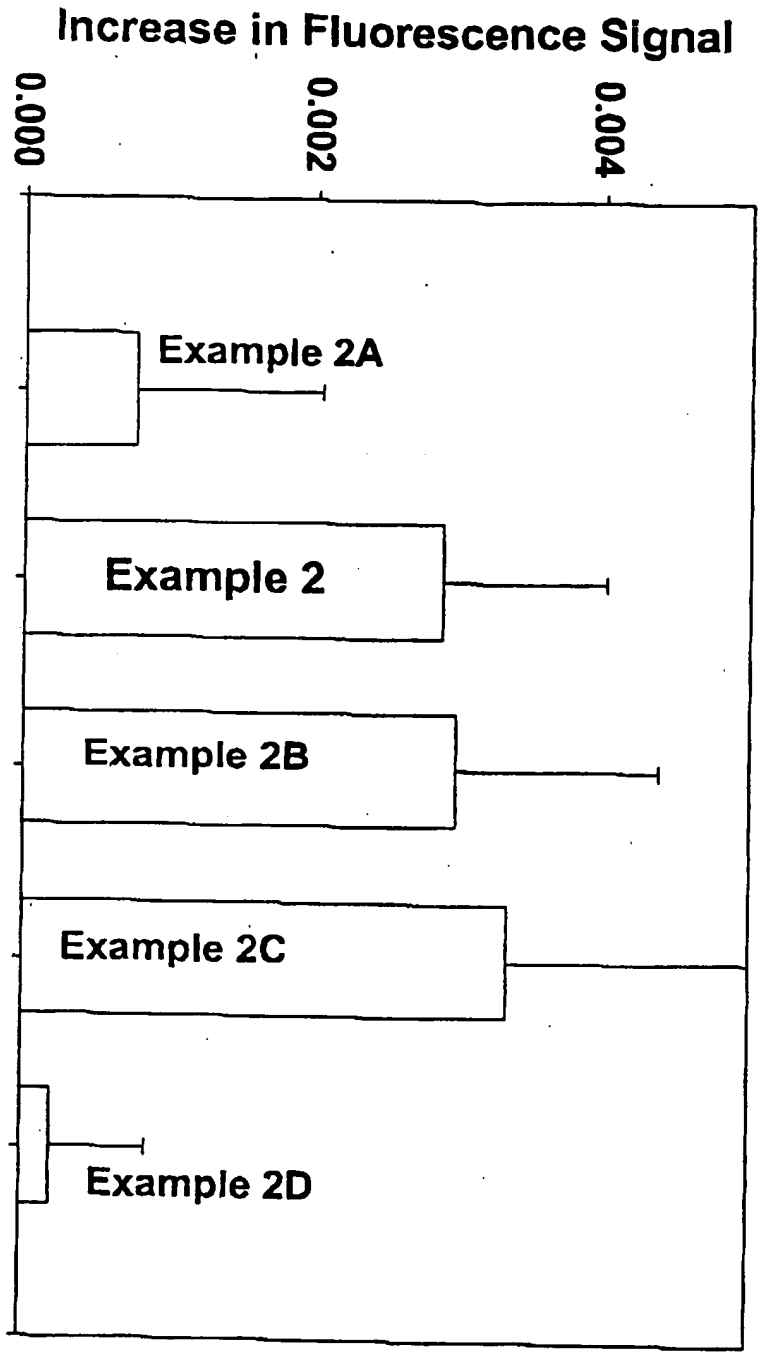
23. A composition as defined in claim 22, wherein said second neutralizing agent comprises sodium hydroxide, potassium hydroxide, diethanolamine, triethanolamine, 2-dimethylaminoethanol, aminobutanol, arginine, lysine, or any combination of any of the foregoing.

24. A method for reducing fine lines, wrinkles, skin roughness, and pore size and for increasing the clarity of a skin surface, cellular turnover, skin radiance, skin smoothness, skin permeation, or collagen synthesis in a mammal in need thereof, said method comprising topically administering a composition as defined in claim 1 to said animal.

25. A method for reducing fine lines, wrinkles, skin roughness, and pore size and for increasing the clarity of a skin surface, cellular turnover, skin radiance, skin smoothness, skin permeation, or collagen synthesis in a mammal in need thereof, said method comprising topically administering a composition as defined in claim 20 to said animal.

Figure 1


Example 1
Example 1A
Example 1B
Example 1C
Skin pH
7
6.5
6
5.5
5
4.5
4
3.5
3
0
25
50
75
100
125
150
175
200
Minutes


Increase in Fluorescence Signal
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0.002
0.004
Example 2A
Example 2
Example 2B
Example 2C
Example 2D

Figure 2

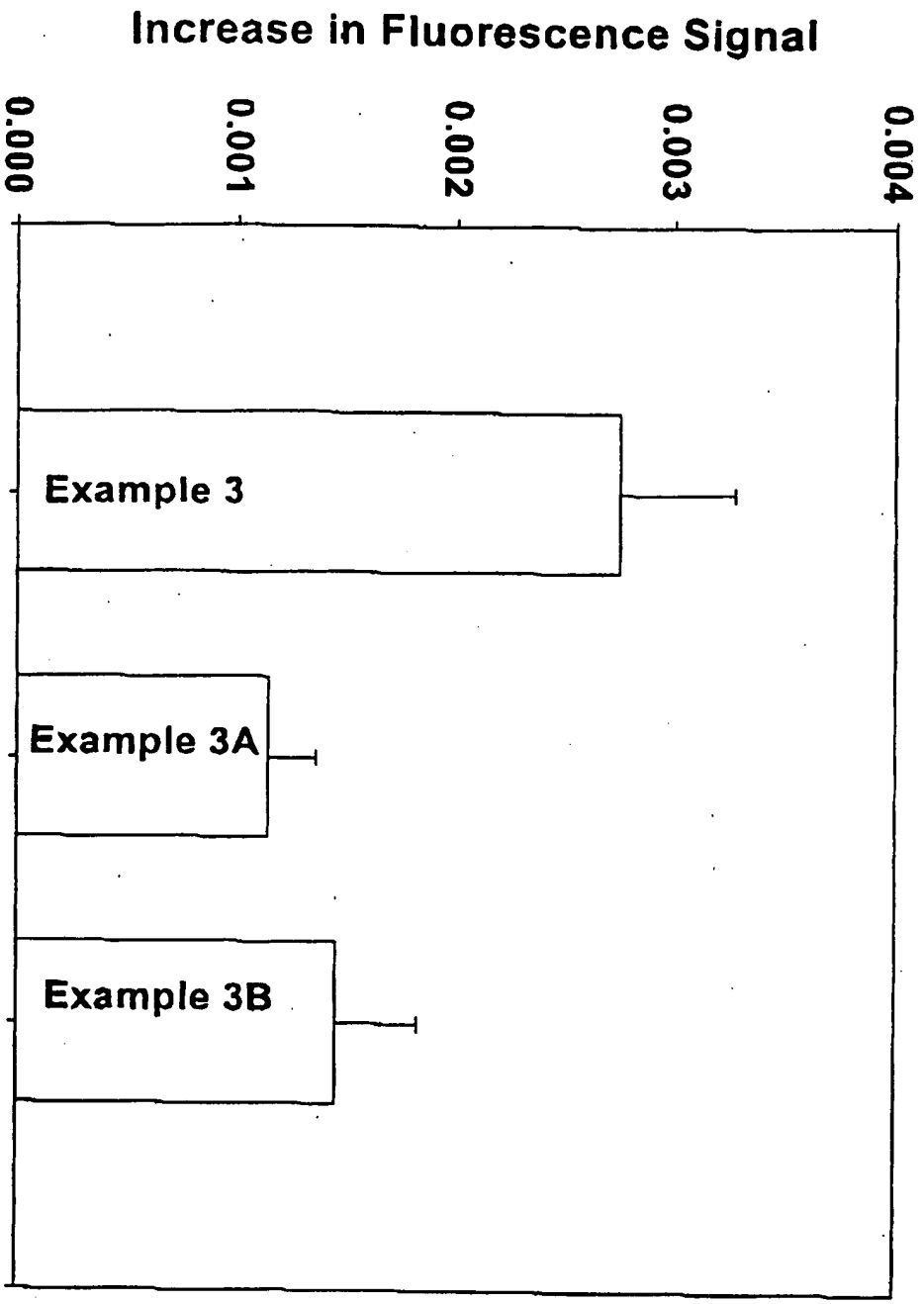
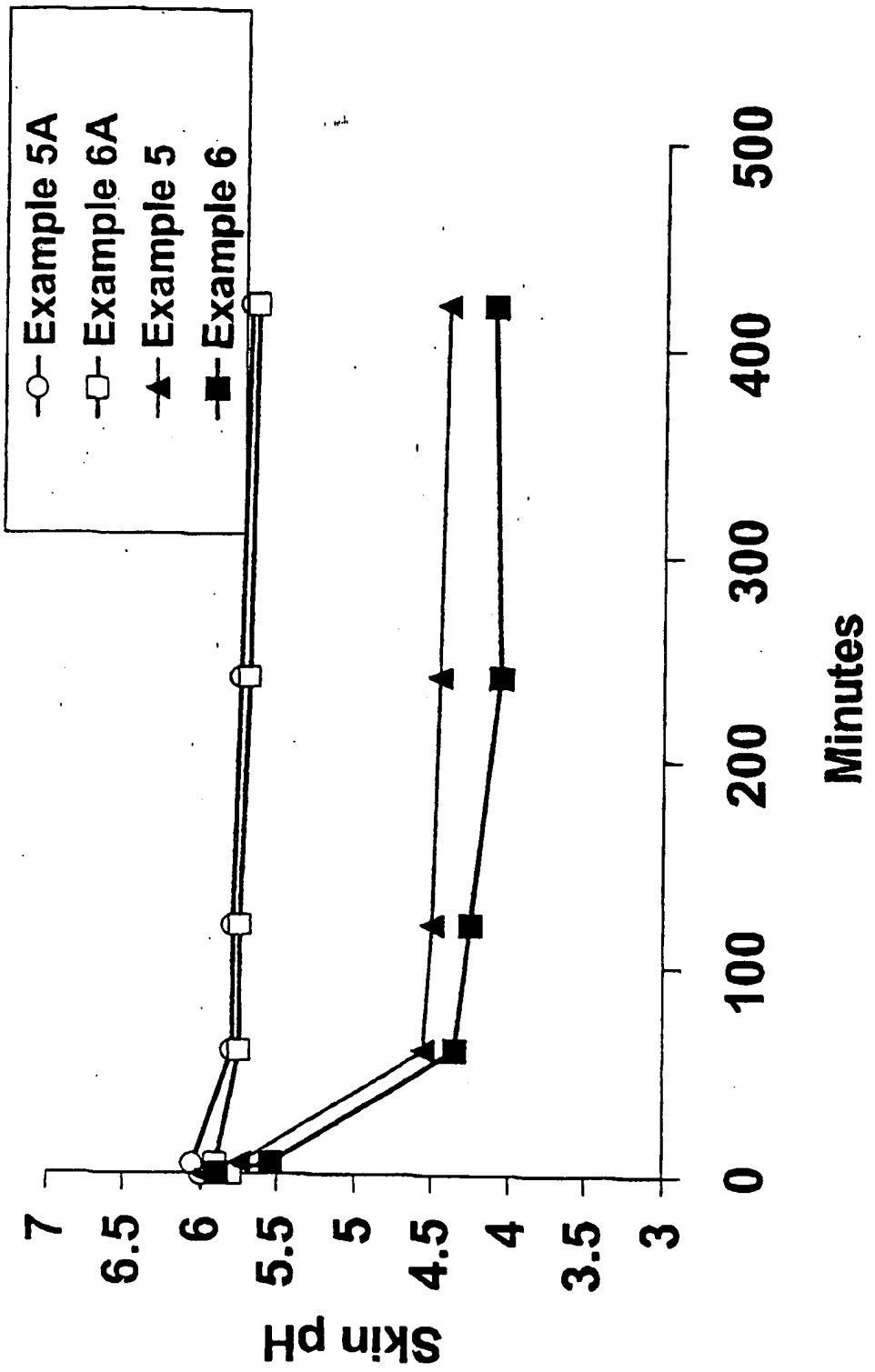

Increase in Fluorescence Signal
0.000
0.001
0.002
0.003
0.004
Example 3
Example 3A
Example 3B

Figure 3

Figure 4


Example 5A
Example 6A
Example 5
Example 6
Skin pH
7
6.5
6
5.5
5
4.5
4
3.5
3
0
100
200
300
400
500
Minutes

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US99/26879

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) :A61K 7/48
US CL : 424/401; 514/725, 844,937

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 424/401; 514/725, 844,937

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WEST DATA BASE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,744,148 A (HABIF et al) 28 April 1998, col. 3, lines 25-40, col. 6, lines 45-65, examples, col. 19, col. 7, lines 55-59.	1-8, 10-25
Y,P	US 5,889,054 A (YU et al) 30 March 1999, abstract, col. 2, lines 50-55, claims .	9

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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"P"	document published prior to the international filing date but later than the priority date claimed		

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